DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-33 and 37-52 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-33 and 37-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over USP 5,707,213 (Conrad hereinafter) in view of USP 5,553,998 (Mühlhoff et al. hereinafter) and Applicants' Admitted Prior Art, specifically Fig. 1 and pages 1 and 2 of the instant application (AAPA hereinafter).

4. In re claim 1 Conrad discloses a vacuum pump comprising a first pumping section (1), a second pumping section (4) downstream from the first pumping section (1), a first pump inlet (12) through which fluid can enter the pump and pass through each of the pumping sections towards a pump outlet (11), and a second pump inlet (13) through which fluid can enter the pump and pass through only the second (4) pumping section towards the pump outlet (11), the second pumping section (4) comprises a helical groove formed in a rotor thereof (Conrad discloses that either a Siegbahn or Holweck pump can be used in this application where the Siegbahn comprises a helical groove formed in a rotor thereof and the Holweck is capable of comprising a helical

groove in both a stator and rotor thereof) and the first (1) and second (4) pumping sections are sized substantially the same in a radial direction, such that the second pumping section (4) that has the helical groove formed in the rotor thereof is able to increase a pumping capacity without a corresponding increase in size.

5. Conrad does not disclose a third pumping section downstream from the second pumping section wherein the third pumping section comprises a helical groove formed in a stator thereof or a first chamber and a second chamber upstream of the first chamber, respectively, the first chamber and the second chamber being disposed serially for enabling a stream of fluid to pass through the second chamber and first chamber sequentially, as the stream of fluid is being simultaneously drawn into the first and second pumping sections via the first and second pump inlets, respectively.

6. Mühlhoff et al. teaches a helical groove formed in a rotor thereof (Fig. 4) as part of a vacuum pump assembly.

7. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Conrad by adding a helical groove formed in a rotor thereof after the first pumping section (placing the helical groove formed in a rotor thereof downstream of the first pumping section (1) and upstream of the second pumping section (4)) as taught in Mühlhoff et al. for the purposes of achieving further influence over the pressure behavior of the pump (col. 2 lines 1-8 of Mühlhoff et al.). This modification results in a vacuum wherein the first pumping stage is a turbomolecular pump (1 of Conrad), the second stage is the Siegbahn pump of Mühlhoff et al. comprising a helical groove formed in a rotor thereof and the third stage

is the Holweck pump (4 of Conrad) comprising a helical groove formed in a stator thereof thus meeting these limitations of claim 1.

8. AAPA teaches a first chamber (10) and a second chamber (14) upstream of the first chamber (10), respectively, the first chamber (10) and the second chamber (14) being disposed serially for enabling a stream of fluid to pass through the second chamber (14) and first chamber (10) sequentially, as the stream of fluid is being simultaneously drawn into a first (18) and second (20) pumping sections via first (24) and second (26) pump inlets, respectively.

9. It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the apparatus of Conrad by forming a first chamber and a second chamber upstream of the first chamber, respectively, the first chamber and the second chamber being disposed serially for enabling a stream of fluid to pass through the second chamber and first chamber sequentially, as the stream of fluid is being simultaneously drawn into the first and second pumping sections via first and second pump inlets, respectively as taught in AAPA for the purposes of providing the required vacuum pressures as discussed in the Specification of the instant application, page 1 line 6 - page 2 line 11 and as shown in Fig. 1.

10. In re claim 2 the Conrad modification in re claim 1 discloses the pump according to claim 1, wherein the depth of the helical groove on the rotor varies from the inlet side thereof to the outlet side thereof (col. 1 lines 63-65 of Mühlhoff et al.).

11. In re claim 3 the Conrad modification in re claim 1 discloses the pump according to claim 2, wherein the depth of the helical groove on the rotor decreases from the inlet side thereof to the outlet side thereof (col. 1 lines 63-65 of Mühlhoff et al.).

12. In re claim 4 the Conrad modification in re claim 1 discloses the pump according to claim 3, wherein the inclination of the helical groove on the rotor varies from the inlet side thereof to the outlet side thereof (col. 1 lines 63-65 of Mühlhoff et al.).

13. In re claim 5 the Conrad modification in re claim 1 discloses the pump according to claim 4, wherein the inclination of the helical groove on the rotor decreases from the inlet side thereof to the outlet side thereof (col. 1 lines 63-65 of Mühlhoff et al.).

14. In re claim 6 the Conrad modification in re claim 1 teaches the pump according to claim 1 but does not explicitly teach that the depth of the groove at the inlet side of the rotor is greater than the depth of the groove at the inlet side of the stator. One of ordinary skill in the vacuum pump art would have known that in the construction of a vacuum pump with multiple stages it is important to, when appropriate, reduce volume in the direction of flow so as to not lose vacuum pressure. It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the pump of the Conrad modification in re claim 1 by making the depth of the groove at the inlet side of the rotor greater than the depth of the groove at the inlet side of the stator as an engineering expedient since it provides a way to maintain desired pressures.

15. In re claim 7 the Conrad modification in re claim 1 discloses the pump according to claim 1, wherein said one of the first and second pumping sections comprises at least one turbo-molecular stage downstream from said rotor.

16. In re claim 8 the Conrad modification in re claim 1 discloses the pump according to claim 5, wherein the second pumping section comprises said rotor.

17. In re claim 9 the Conrad modification in re claim 1 discloses the pump according to claim 8, wherein the first pumping section comprises at least one turbo-molecular stage.

18. In re claim 10 the Conrad modification in re claim 1 discloses all of the limitations except for wherein the turbomolecular stage of the first pumping section is arranged such that, in use, molecules of fluid entering the helical groove on the rotor are emitted from the surface of a stator thereof. The Conrad modification in re claim 1 discloses that molecules of fluid entering the helical groove on the rotor are emitted from the surface of a rotor of the turbomolecular stage.

19. A person having ordinary skill in the art would recognize as an engineering expedient that the molecules of fluid entering the helical groove on the rotor are able to be emitted from the surface of a stator or from the surface of a rotor.

20. It would have been obvious to one having ordinary skill in the art to assemble the apparatus of the Conrad modification in re claim 1 by arranging the turbomolecular stage of the first pumping section such that, in use, molecules of fluid entering the helical groove on the rotor are emitted from the surface of a stator thereof since it is one of a finite number of identifiable assembly methods (primarily, molecules of fluid

entering the helical groove on the rotor are emitted from the surface of a stator or from the surface of a rotor) which results in the Conrad modification in re claim 1 structure as a predictable solution with a reasonable expectation of success.

21. In re claim 11 the Conrad modification in re claim 1 discloses the pump according to claim 9, wherein the first pumping section comprises at least three turbo-molecular stages (Conrad Fig.).

22. In re claim 12 the Conrad modification in re claim 1 discloses the pump according to claim 10, wherein both the first (1) and second pumping sections are axially displaced relative to the first (12) and second (13) inlets.

23. In re claim 13 the Conrad modification in re claim 1 discloses the pump according to claim 12, wherein one of the first (12) and second (13) inlets extends at least partially around the rotor.

24. In re claims 31-33 and 37-41, in that claims 31-33 and 37-41 are substantially the same as claims 3-5 and 9-13 (respectively), claims 31-33 and 37-41 are similarly rejected.

25. In re claims 42 and 43, in that claims 42 and 43 are substantially the same as claims 12 and 13 (respectively), claims 42 and 43 are similarly rejected.

26. In re claim 52 the Conrad modification in re claim 1 discloses a differentially pumped vacuum system comprising two chambers and further comprising a pump according to claim 1 for evacuating each of the chambers.

27. In re claim 14 the Conrad modification in re claim 1 discloses a vacuum pump comprising a first pumping section (1) and, downstream therefrom, a second pumping

section (4), a first pump inlet (12) through which fluid can enter the pump and pass through both the first pumping section (1) and the second pumping section (4) towards a pump outlet (11), and a second pump inlet (13) through which fluid can enter the pump and pass through, of said sections, only the second pumping section (4) towards the pump outlet (11), wherein the second pumping section comprises an externally threaded rotor (Fig. 4 of Mühlhoff et al.), the second (13) pump inlet extends at least partially about the externally threaded rotor, and the first and second pumping sections are sized substantially the same in a radial direction, such that the second pumping section that has the externally threaded rotor is able to increase a pumping capacity without a corresponding increase in size, wherein the first and second pump inlets are in fluid connection with a first chamber (10 of AAPA) and a second chamber (14 of AAPA) upstream of the first chamber (10 of AAPA), respectively, the first chamber (10 of AAPA) and the second chamber (14 of AAPA) being disposed serially for enabling a stream of fluid to pass through the second chamber (14 of AAPA) and first chamber (10 of AAPA) sequentially, as the stream of fluid is being simultaneously drawn into the first and second pumping sections via the first (24 of AAPA) and second (26 of AAPA) pump inlets respectively.

28. In re claim 15 the Conrad modification in re claim 1 discloses the pump according to claim 14, wherein the externally threaded rotor comprises a helical groove.

29. In re claims 16-20, in that claims 16-20, are substantially the same as claims 2-5 and 7 (respectively), claims 16-20 are similarly rejected.

30. In re claim 47 the Conrad modification in re claim 1 discloses the pump according to claim 20 wherein the second pumping section comprises said externally threaded rotor, the second inlet (13) extending at least partially around the rotor.

31. In re claims 48 and 49, in that claims 48 and 49 are substantially the same as claims 9 and 10 (respectively), claims 48 and 49 are similarly rejected.

32. In re claim 50 the Conrad modification in re claim 1 discloses the pump according to claim 49 comprising at least one additional pumping (the third pumping section as described in the rejection of claim 1, above) section downstream from the first and second pumping sections for receiving fluid therefrom and outputting fluid towards the outlet (11).

33. In re claims 21-24 in that claims 21-24 are substantially the same as claims 47, 9, 11 and 10 (respectively), claims 21-24 are similarly rejected.

34. In re claims 25, 44, 45 and 51 in that claims 25, 44, 45 and 51 are substantially the same as claim 50, claims 25, 44, 45 and 51 are similarly rejected.

35. In re claim 26 the Conrad modification in re claim 1 discloses the pump according to claim 25, wherein said at least one additional pumping section comprises a molecular drag stage (the third pumping section (the Holweck section) as described in the rejection of claim 1, above).

36. In re claims 46 and 27 in that claims 46 and 27 are substantially the same as claims 26 and 52 (respectively), claims 46 and 27 are similarly rejected.

37. In re claim 28 the Conrad modification in re claim 1 discloses the pump according to claim 27, wherein one of the pumping sections arranged to pump fluid from a

chamber in which a pressure of above 10^{-3} mbar is to be generated (col. 1 lines 29-35 of Mühlhoff et al.) comprises an externally threaded rotor.

38. In re claim 30 the Conrad modification in re claim 1 discloses the pump according to claim 28 wherein at least one of the pumping stages arranged to pump fluid from a chamber in which a pressure of above $5x10^{-3}$ mbar is to be generated (col. 1 lines 29-35 of Mühlhoff et al.) comprises an externally threaded rotor.

39. In re claim 29 the Conrad modification in re claim 1 discloses the pump according to claim 27 wherein at least one of the pumping stages arranged to pump fluid from a chamber in which a pressure of above $5x10^{-3}$ mbar is to be generated (col. 1 lines 29-35 of Mühlhoff et al.) comprises an externally threaded rotor.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AARON R. EASTMAN whose telephone number is (571)270-3132. The examiner can normally be reached on Mon-Thu 9:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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